IN THE CLAIMS:

1. (PREVIOUSLY PRESENTED) A policer based on Random Early Detection (RED), comprising:

a filter to determine a filtered virtual time debt, the filtered virtual time debt determined based on an average difference between a time packets are expected to arrive and a time the packets actually arrive; and

a control law circuit to receive the filtered virtual time debt from the filter and to determine whether a packet should be dropped.

2. (PREVIOUSLY PRESENTED) The RED policer of claim 1, wherein a virtual time debt is configured to use a time T in which a packet is expected to arrive and is computed using a predetermined output transmission rate.

3. (ORIGINAL) The RED policer of claim 2, wherein predetermined output transmission rate is given by a traffic contract.

4. (PREVIOUSLY PRESENTED) The RED policer of claim 1, wherein the filter is based on an exponential weighted moving average (EWMA) virtual time delay using the expression,

$$EWMA_k = (1-g)EWMA_{k-1} + g(VTD)_k,$$

where k indicates the presently received packet, and k-1 indicates the last packet received, the virtual time debt (VTD) is computed by the expression: VTD = T(packet expected to arrive) – T(packet actually arrives), and g is the gain of the filter.

5. (PREVIOUSLY PRESENTED) The RED policer of claim 1, further comprising: a sampler to sample a virtual time debt at a sampling interval, and to transmit the sampled virtual time debt to the filter.

6. (PREVIOUSLY PRESENTED) The RED policer of claim 1, further comprising:

a random generator to generate a number based on the control law circuit's determination as to whether a packet should be dropped; and

a counter configured to be set with the number generated by the random generator, wherein the counter is configured to count packets passing through the RED policer up to the set number, and wherein the RED policer is configured to drop a packet when the counter has counted out the set number.

7. (PREVIOUSLY PRESENTED) The RED policer of claim 6, further comprising:

the control law circuit to determine a probability of a packet being dropped based on the filtered time debt exceeding a predetermined minimum threshold, and to specify a range of numbers based on the probability; and

the random generator to randomly generate a number in the range specified by the control law circuit.

8. (PREVIOUSLY PRESENTED) A policer based on Random Early Detection (RED), comprising:

means for determining a moving average of a virtual time debt, the virtual time debt determined based on a difference between a time packets are expected to arrive and a time the packets actually arrive; and

means for determining wheher a packet should be dropped based on a value of the moving average of the virtual time debt.

9. (ORIGINAL) The RED policer of claim 8, further comprises means for sampling a virtual time debt at a sampling interval, and transmitting the result to the moving average determining means.

10. (ORIGINAL) The RED policer of claim 8, further comprises:

means for generating a random number based on the result of the packet dropping means; and

means for counting a number of packets passing through the RED policer up to the random number generated by the random number generating means, wherein the RED policer drops a packet when the counting means has counted out the generated random number.

11. (PREVIOUSLY PRESENTED) A network device comprising:

a plurality of Random Early Detection (RED) policers, wherein each RED policer comprises,

a filter to determine a filtered virtual time debt, the filtered virtual time debt determined based on an average difference between a time packets are expected to arrive and a time the packets actually arrive; and

a control law circuit to receive the filtered virtual time debt from the filter and to determine whether a packet should be dropped; and

a packet classifier to determine which packet should go to which RED policer.

12. (PREVIOUSLY PRESENTED) A method of policing packets in a network device, the method comprising the steps of:

determining a filtered virtual time debt of a traffic, the filtered virtual time debt determined based on an average difference between a time packets of the traffic are expected to arrive and a time the packets actually arrive;

comparing the filtered virtual time debt with a predetermined minimum threshold; and if the filtered virtual time debt exceeds the minimum threshold, then

generating a random number that is used to determine which paeket should be dropped.

13. (ORIGINAL) The method of claim 12, wherein generating a random number further comprises the steps of:

generating the random number in a range based on a level by which the filtered virtual time debt exceeds the minimum threshold;

setting a counter with the random number; and

dropping a packet when the counter has counted out the random number.

14. (PREVIOUSLY PRESENTED) A computer readable medium having instructions contained therein, which when executed by a computer performs a method comprising the steps of:

determining a filtered virtual time debt of a traffic, the filtered virtual time debt determined based on an average difference between a time packets of the traffic are expected to arrive and a time the packets actually arrive;

comparing the filtered virtual time debt with a predetermined minimum threshold; and if the filtered virtual time debt exceeds the minimum threshold, then

generating a random number that is used to determine which packet should be dropped.

15. (ORIGINAL) The medium of claim 14, wherein generating a random number further comprises the steps of:

generating the random number in a range based on a level the filtered virtual time debt exceeds the minimum threshold;

setting a counter with the random number; and

dropping a packet when the counter has counted out the random number.

16. (CANCELLED)

17. (PREVIOUSLY PRESENTED) A method of policing packets in a network device, the method comprising the steps of:

determining a filtered virtual time debt of packets flowing through the network device, the filtered virtual time debt determined based on an average difference between a time packets are expected to arrive and a time the packets actually arrive; and

determining whether a packet should be dropped based on the filtered virtual time debt of the packets.

18. (PREVIOUSLY PRESENTED) The method as in claim 17, further comprising: determining that a packet should be dropped when a virtual time debt threshold has been reached.

19. (PREVIOUSLY PRESENTED) The method as in claim 17, further comprising: determining a moving average of the virtual time debt.

20. (PREVIOUSLY PRESENTED) The method as in claim 17, further comprising: calculating the virtual time debt as the difference between a time a packet is expected to arrive and a time the packet actually arrives.

21. (PREVIOUSLY PRESENTED) The method as in claim 20, further comprising: calculating the time a packet is expected to arrive according to a traffic contract.

22. (PREVIOUSLY PRESENTED) The method as in claim 17, further comprising: sampling the virtual time debt at a sampling interval.

23. (PREVIOUSLY PRESENTED) The method as in claim 17, further comprising:

generating a random number;

counting a number of packets passing through the network device up to the random number; and

dropping a packet when the counted number reaches the random number.

24. (PREVIOUSLY PRESENTED) A method of policing packets in a network device, the method comprising the steps of:

determining a filtered virtual time debt of packets flowing through the network device, the filtered virtual time debt computed as an average positive delay from an expected packet arrival time established by a traffic contract to an actual packet arrival time;

determining that packets should be dropped when the filtered virtual time debt of the packets exceeds a predetermined value; and if so

choosing a packet to be dropped, the chosen packet in response to a random number; and

dropping the chosen packet.

25. (PREVIOUSLY PRESENTED) The method as in claim 24, further comprising:

generating the random number;

counting a number of packets passing through the network device up to the random number; and

dropping a packet when the counted number reaches the random number.

26. (PREVIOUSLY PRESENTED) A policer, comprising:

means for determining a filtered virtual time debt of packets flowing through the network device, the virtual time debt computed as an average positive delay from an expected packet arrival time established by a traffic contract to an actual packet arrival time;

means for determining that packets should be dropped when the virtual time debt of the packets exceeds a predetermined value; and if so

means for choosing a packet to be dropped, the chosen packet in response to a random number; and

means for dropping the chosen packet.

27. (PREVIOUSLY PRESENTED) A computer readable media, the computer readable media containing instructions for execution in a processor for the practice of the method comprising the steps of:

determining a filtered virtual time debt of packets flowing through the network device, the filtered virtual time debt determined based on an average difference between a time packets are expected to arrive and a time the packets actually arrive; and

determining whether a packet should be dropped based on the filtered virtual time debt of the packets.

28. (CANCELLED).

29. (PREVIOUSLY PRESENTED) A method of policing packets in a network device, the method comprising the steps of:

determining a filtered virtual time debt of packets flowing through the network device, the filtered virtual time debt computed as an average positive delay from an expected packet arrival time to an actual packet arrival time; and

determining whether a packet should be dropped based on the filtered virtual time debt of the packets.

30. (PREVIOUSLY PRESENTED) The method as in claim 29, in the event a packet should be dropped, further comprising:

generating a random number;

counting a number of packets passing through the network device up to the random number; and

dropping a packet when the counted number reaches the random number.

31. (PREVIOUSLY PRESENTED) A method of policing packets in a network device, comprising:

determining an actual arrival time of a packet;

determining a theoretical arrival time of the packet;

calculating a virtual time debt in response to the actual arrival time and the theoretical arrival time;

using a filter to determine a filtered virtual time debt of a traffic, the filtered virtual time debt determined based on an average of a plurality of virtual time debts for the traffic;

comparing the filtered virtual time debt with a predetermined value;

deciding if the filtered virtual time debt exceeds the predetermined value; and

generating, in response to the filtered virtual time debt exceeding the predetermined value, a random number that is used to determine which packet should be dropped.

32. (CANCELLED)

33. (PREVIOUSLY PRESENTED) The method of claim 31, further comprising:

computing a predetermined output transmission rate.

34. (PREVIOUSLY PRESENTED) The method of claim 33, further comprising:

setting the predetermined output transmission rate by a traffic contract.

35. (PREVIOUSLY PRESENTED) The method of claim 31, further comprising:

sampling the virtual time debt at a sampling interval; and

transmitting the sampled virtual time debt to the filter.

36. (PREVIOUSLY PRESENTED) The method of claim 31, further comprising:

using a counter that is set with the generated random number;

counting packets passing through a RED policer up to the set number;

dropping the packet when the counter has counted out the set number.

37. (PREVIOUSLY PRESENTED) The method of claim 31, further comprising:

determining a moving average for the filtered virtual time debt.

38. (PREVIOUSLY PRESENTED) A policer based on Random Early Detection (RED), comprising:

an operating system to determine an actual arrival time of a packet and a theoretical arrival time of the packet;

a control law circuit to i) calculate a virtual time debt in response to the actual arrival time and the theoretical arrival time,

a filter to determine a filtered virtual time debt of a traffic, the filtered virtual time debt determined based on an average of a plurality of virtual time debts for the traffic;

the control law circuit further to ii) compare the filtered virtual time debt with a predetermined value, and iii) decide if the filtered virtual time debt exceeds the predetermined value; and

a random number generator to generate, in response to the filtered virtual time debt exceeding the predetermined value, a random number that is used to determine which packet should be dropped.

39. (CANCELLED)

40. (PREVIOUSLY PRESENTED) The policer of claim 38, further comprising:

the filtered virtual time debt is configured to use time T in which the packet is expected to arrive, and is computed using a predetermined output transmission rate.

41. (PREVIOUSLY PRESENTED) The policer of claim 40, further comprising:

the predetermined output transmission rate is given by a traffic contract.

42. (PREVIOUSLY PRESENTED) The policer of claim 38, further comprising:

a sampler to sample the virtual time debt at a sampling interval and to transmit the sampled virtual time debt to the filter.

43. (PREVIOUSLY PRESENTED) The policer of claim 38, further comprising:

a counter configured to be set with the number generated by the random number generator, and configured to count packets passing through the RED policer up to the set number; and

the RED policer configured to drop the packet when the counter has counted out the set number.

44. (PREVIOUSLY PRESENTED) The policer of claim 38, further comprising:

the filter further to determine a moving average for the filtered virtual time debt.

45. (PREVIOUSLY PRESENTED) An apparatus for policing packets in a network device, comprising:

means for determining an actual arrival time of a packet;

means for determining a theoretical arrival time of the packet;

means for calculating a virtual time debt in response to the actual arrival time and the theoretical arrival time;

means for using a filter to determine a filtered virtual time debt of a traffic, the filtered virtual time debt determined based on an average of a plurality of virtual time debts for the traffic;

means for comparing the filtered virtual time debt with a predetermined value;

means for deciding if the filtered virtual time debt excecds the predetermined value; and

means for generating, in response to the filtered virtual time debt exceeding the predetermined value, a random number that is used to determine which packet should be dropped.

46. (CANCELLED)

47. (PREVIOUSLY PRESENTED) The apparatus of claim 45, further comprising:

means for computing a predetermined output transmission rate.

48. (PREVIOUSLY PRESENTED) The apparatus of claim 47, further comprising:

means for setting the predetermined output transmission rate by a traffic contract.

49. (CANCELLED)

50. (PREVIOUSLY PRESENTED) The apparatus of claim 45, further comprising:

means for using a counter that is set with the number gencrated by the random number generator;

means for counting packets passing through a RED policer up to the set number;

means for dropping the paeket when the counter has counted out the set number.

51. (PREVIOUSLY PRESENTED) Thc apparatus of claim 45, further comprising:

means for determining a moving average for the filtered virtual time debt.

52. (PREVIOUSLY PRESENTED) A computer readable medium having instructions contained therein, which when executed by a computer performs a method comprising the steps of:

determining an actual arrival time of a packet;

determining a theorctical arrival time of the packet;

calculating a virtual time debt in response to the actual arrival time and the theoretical arrival time;

using a filter to determine a filtered virtual time debt of a traffic, thc filtered virtual time debt determined based on an averagc of a plurality of virtual time debts for the traffic;

comparing the filtered virtual time debt with a predetermined value;

deciding if the filtered virtual time debt exceeds the predetermined value; and

generating, in response to the filtered virtual time debt exceeding the predetermined value, a random number that is used to determine which packet should be dropped.

53. (CANCELLED)

54. (PREVIOUSLY PRESENTED) The RED policer of claim 1, further comprising: the filter further configured to calculate the average as an exponential weighted moving average (EWMA).

55. (PREVIOUSLY PRESENTED) The RED policer of claim 8, further comprising: means for calculating the average as an exponential weighted moving average (EWMA).

56. (PREVIOUSLY PRESENTED) The network device of claim 11, further comprising: the filter further configured to calculate the average as an exponential weighted moving average (EWMA).

57. (PREVIOUSLY PRESENTED) The method of claim 12, further comprising: calculating the average as an exponential weighted moving average (EWMA).

58. (PREVIOUSLY PRESENTED) The medium of claim 14, further comprising the step of: calculating the average as an exponential weighted moving average (EWMA).

59. (PREVIOUSLY PRESENTED) The method of claim 17, further comprising: calculating the average as an exponential weighted moving average (EWMA).

60. (PREVIOUSLY PRESENTED) The method of claim 24, further comprising: calculating the average as an exponential weighted moving average (EWMA).

61. (PREVIOUSLY PRESENTED) The policer of claim 26, further comprising: means for calculating the average as an exponential weighted moving average (EWMA).

62. (PREVIOUSLY PRESENTED) The medium of claim 27, further comprising the step of: calculating the average as an exponential weighted moving average (EWMA).

63. (PREVIOUSLY PRESENTED) The method of claim 29, further comprising: calculating the average as an exponential weighted moving average (EWMA).

64. (PREVIOUSLY PRESENTED) The method of claim 31, further comprising: calculating the average as an exponential weighted moving average (EWMA).

65. (PREVIOUSLY PRESENTED) The policer of claim 38, further comprising: the filter further configured to calculate the average as an exponential weighted moving average (EWMA).

66. (PREVIOUSLY PRESENTED) The apparatus of claim 45, further comprising: means for calculating the average as an exponential weighted moving average (EWMA).

67. (PREVIOUSLY PRESENTED) The medium of claim 52, further comprising the step of: calculating the average as an exponential weighted moving average (EWMA).